PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

BAILEY WALSH & CO.
5, York Place
Leeds LS1 2SD
ROYAUME-UNI

Date of mailing (day/month/year)
11 January 2001 (11.01.01)

Applicant's or agent's file reference
GW-SR-X8481-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/02362

International filing date (day/month/year)
03 July 2000 (03.07.00)

1. The following indications appeared on record concerning:

[ ] the applicant [ ] the inventor [X] the agent [ ] the common representative

Name and Address
ORR, William, Mclean
Urquhart-Dykes & Lord
Tower House
Merrion Way
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United Kingdom

State of Nationality

State of Residence

Telephone No.
0113 2452388

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[X] the person [X] the name [X] the address [ ] the nationality [ ] the residence

Name and Address
BAILEY WALSH & CO.
5, York Place
Leeds LS1 2SD
United Kingdom

State of Nationality

State of Residence

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Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[X] the designated Offices concerned
[ ] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
Peggy Steunenberg

Telephone No.: (41-22) 338.83.38

F ;ENT COOPERATION TREA . .'

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Comm'ssioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 21 March 2001 (21.03.01)	
International application No. PCT/GB00/02362	**Applicant's or agent's file reference** GW-SR-X8481-PCT
International filing date (day/month/year) 03 July 2000 (03.07.00)	**Priority date** (day/month/year) 02 July 1999 (02.07.99)
Applicant MCNIVEN, Tom	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

16 January 2001 (16.01.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Pascal Piriou
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
AA/JDAS/P50261WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/GB 00/ 02362	03/07/2000	02/07/1999
Applicant		
MCNIVEN, Tom		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows: - 6 DEC 2000

5. With regard to the **abstract,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1A

   [ ] as suggested by the applicant.

   [X] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

line 1-...member (3)...
line 2-...member (10)...
line 3-...airbag (9)...

INTERNATIONAL SEARCH REPORT

International Application No
PC[redacted]B 00/02362

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B66F7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B66F F15B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 193 264 A (BOUSSO DINO E) 28 May 1970 (1970-05-28) page 2, line 34 - line 50 page 2, line 112 -page 3, line 6 figures 1-3	1,2,4, 6-10
X	US 5 446 938 A (WARNER ROBERT J ET AL) 5 September 1995 (1995-09-05) the whole document	1,3,6-10
X	GB 2 206 158 A (MCNIVEN THOMAS) 29 December 1988 (1988-12-29) abstract page 4, line 18 -page 6, line 24 figures 3-8	1,2,4-7

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 September 2000	02/10/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sheppard, B

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02362

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 542 806 A (KANG LEI) 6 August 1996 (1996-08-06) abstract figures 1-5	1,2,4-7
X	GB 1 501 047 A (PINGON PIERRE JOSEPH) 15 February 1978 (1978-02-15) page 2, line 74 -page 3, line 10 figure 1	1,2,4,6

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 00/02362

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
GB 1193264	A	28-05-1970	BE	701012 A	18-12-1967
			CH	500379 A	15-12-1970
			CS	159732 B	31-01-1975
			DE	1601704 A	13-08-1970
			ES	342746 A	01-08-1968
			FR	1531817 A	14-11-1968
			NL	6709411 A,B	09-01-1968
			SE	329338 B	05-10-1970
			US	3495502 A	17-02-1970
US 5446938	A	05-09-1995	CA	2173211 A	13-04-1995
			EP	0721424 A	17-07-1996
			WO	9509792 A	13-04-1995
GB 2206158	A	29-12-1988	AU	1987788 A	19-01-1989
			WO	8810232 A	29-12-1988
US 5542806	A	06-08-1996	NONE		
GB 1501047	A	15-02-1978	FR	2306929 A	05-11-1976
			FR	2334615 A	08-07-1977
			AT	346534 B	10-11-1978
			AT	259676 A	15-03-1978
			AU	496785 B	26-10-1978
			AU	1282276 A	13-10-1977
			BE	838615 A	16-06-1976
			BR	7602205 A	05-10-1976
			CA	1051415 A	27-03-1979
			CH	605395 A	29-09-1978
			DE	2614754 A	21-10-1976
			ES	445902 A	01-09-1977
			IT	1058808 B	10-05-1982
			JP	52031454 A	09-03-1977
			NL	7602202 A	13-10-1976
			SE	405108 B	20-11-1978
			SE	7602588 A	12-10-1976
			US	4030701 A	21-06-1977
			ZA	7601283 A	23-02-1977

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
GW-SAR-X8481-PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB00/02362	03/07/2000	02/07/1999
International Patent Classification (IPC) or national classification and IPC B66F7/08		
Applicant McNIVEN, Tom		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☒ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
16/01/2001	21.09.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Eckenschwiller, A Telephone No. +49 89 2399 2088

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02362

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-9	as originally filed

Claims, No.:

1-10	as originally filed

Drawings, sheets:

1/18-18/18	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   ☐ the language of publication of the international application (under Rule 48.3(b)).
   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.
   ☐ filed together with the international application in computer readable form.
   ☐ furnished subsequently to this Authority in written form.
   ☐ furnished subsequently to this Authority in computer readable form.
   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:
   ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

☐ restricted the claims.

☐ paid additional fees.

☐ paid additional fees under protest.

☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

☐ complied with.

☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☒ all parts.

☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-10
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-10

Industrial applicability (IA) Yes: Claims 1-10
No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
se separate sheet

Section IV

The separate inventions with their respective technical problem are:

1) Claims 1-8, 10: to provide an apparatus for handling a load.

2) Claim 9: to provide an airbag.

These two inventions are clearly not so linked as to form a single inventive concept (Rule 13.1 PCT). The link between an apparatus for handling a load and an airbag is not provided, since an airbag may have a plurality of applications.

Section V

1. The present application does not meet the requirements of Articles 33(1) PCT, because the subject-matter of claims 1-10 is not new in the sense of Article 33(2) PCT.

1.1 GB-A-1193264, which is considered to represent the closest prior art, discloses a load handling apparatus (page 2, lines 39-44) comprising one first elongate member 1 for handling a load and one second elongate member 2 pivotally connected to said first elongate member, and actuating means 7 cooperating with said first and second elongate members to change the angular orientation of said first and second elongate members relative to each other.

The subject-matter of claim 1 is also disclosed in US-A-5542806.

1.2 The subject-matter of the dependent claims 2-8 and claims 9 and 10 is either known from GB-A-1193264 or US-A-5542806. These claims are therefore also not novel.

Section VII

1. Independent claims 1 and 9 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features

known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art documents are not mentioned in the description.

Section VIII

The vague and imprecise statement in the description on page 9 implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them (see also the PCT Guidelines, III-4.3a).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 January 2001 (11.01.2001)

PCT

(10) International Publication Number
WO 01/02281 A1

(51) International Patent Classification[7]: B66F 7/08

(21) International Application Number: PCT/GB00/02362

(22) International Filing Date: 3 July 2000 (03.07.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9915384.3 2 July 1999 (02.07.1999) GB

(71) Applicant and
(72) Inventor: MCNIVEN, Tom [GB/GB]; Unit 3, Spence Mills, Mill Lane, Bramley, Leeds LS12 3HE (GB).

(74) Agent: ORR, William, Mclean; Urquhart-Dykes & Lord, Tower House, Merrion Way, Leeds LS2 8PA (GB).

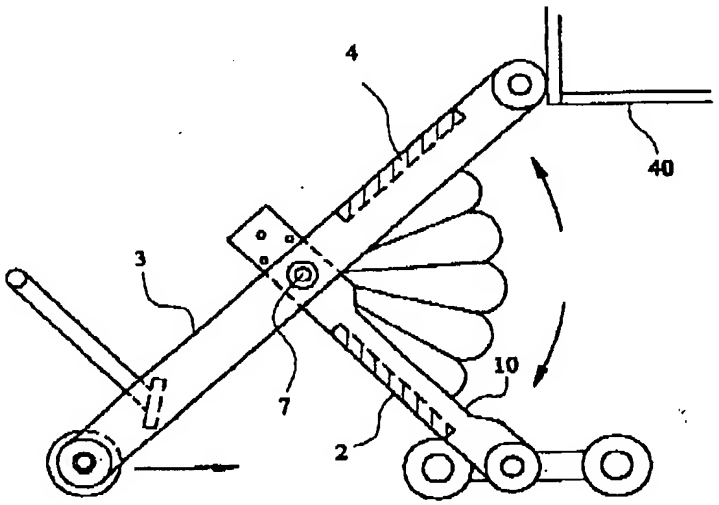
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LOAD HANDLING APPARATUS



(57) Abstract: The load handling apparatus comprises at least one first elongate member (3) having means for engaging a load and at least one second elongate member (10) pivotally connected to said first-mentioned elongate member. An airbag (9) cooperating with said first and second elongate members changes the angular orientation of said first and second elongate members relative to each other upon inflation/deflation of the airbag.

WO 01/02281 A1

LOAD HANDLING APPARATUS

The present invention relates to apparatus for handling loads, particular for lifting , positioning and/or tilting large or small and/or heavy loads.

According to a first aspect of the present invention, there is provided load handling apparatus comprising at least one first elongate member having means for engaging a load and at least one second elongate member pivotally connected to said first-mentioned elongate member, and actuating means cooperating with said first and second elongate members to change the angular orientation of said first and second elongate members relative to each other.

The first member may engage directly with the load to be handled, or with additional elongate members disposed so as to transmit the relative movement of said first and second members to the load, which is thereby manipulated as required.

In its basic embodiment, the at least one first member is about twice the length of said at least one second member, but the invention also encompasses a variant in which the two members are of equal length. This latter embodiment may be achieved by affixing to the second member an extension member which lengthens the second member to a length which is equal to the first member. Alternatively, this latter embodiment may be achieved by providing the first member as a rigid member and the second member as a broken member comprising two pivotally connected arms of equal length.

It is preferred that said "at least one" first and second members actually each comprise a pair of members, which will hereinafter be referred to as the first pair and the second pair respectively, each member of each pair being disposed generally parallel to the other member of the same pair and the two pairs being connected together by means of a pivot rod.

The actuating means may comprise a hydraulic or pneumatic mechanism, but it is preferred

that the actuating means comprises an airbag which can be inflated by means of an airline, high pressure air bottle, battery operated compressor or the like. Alternatively, the airbag may be connected via suitable coupling means to a bolt-on air reservoir, such that the apparatus may be converted into a low profile self-levelling apparatus.

The airbag is conveniently disposed close to the point of pivotal connection between said first and second arms and is constructed such that inflation of the bag will cause a greater degree of inflation in the distal regions of the bag furthest away from the pivotal connection and a much lesser degree of inflation in the proximal region closest to the pivotal connection. Thus, the distal edge of the airbag inflates over an arc which is typically up to 90 degrees, such that the degree of tilt thereby imparted is up to 45 degrees.

Preferably, a lifting plate extends between the first pair of arms, which may also include means for connecting an attachment at an upper end thereof. Instead or in addition, a lifting table or platform may extend between the first and second pairs of arms (in the case where these are of equal length), to provide low profile vertical lifting upon inflation of the airbag.

However, the actuating means may alternatively be a hydraulically operated wedge device which may be driven laterally to achieve the same result.

According to a second aspect of the present invention there is provided an airbag having a number of interconnecting compartments, wherein inflation of the airbag is restrained at one edge or part thereof.

According to a third aspect of the present invention there is provided load handling apparatus comprising at least one first elongate member having means for engaging a load and at least one second elongate member pivotally connected to said first-mentioned elongate member, and an airbag cooperating with said first and second elongate members to change the angular orientation of said first and second elongate members relative to each other upon inflation/deflation of the airbag.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates one embodiment of the first aspect of the invention;

Figure 1A illustrates a variant of the embodiment of Figure 1;

Figure 2 is a plan view of the apparatus of Figure 1;

Figure 2A is a plan view of the embodiment of Figure 1A;

Figure 2B illustrates the extension member for connection to the apparatus shown in Figure 1;

Figure 3 illustrates a further embodiment of the first aspect of the invention;

Figure 4 is a plan view of the apparatus of Figure 3;

Figure 5a illustrates the use of a horizontal lifting platform;

Figure 5b illustrates a cross section along line XX' through the table part of Figure 5a;

Figure 6 is a plan view of the apparatus of Figure 5;

Figure 7 illustrates the use of multiple units of the apparatus of Figures 3 and 4;

Figure 8 illustrates the use of the unit of Figures 3 and 4 combined with the unit of Figures 1 and 2;

Figure 9 illustrates the use of the apparatus to discharge the contents of a container;

Figure 10 illustrates the use of an attachment;

Figures 11, 12 and 13 illustrate the method of construction of the airbag;

Figure 14 is a section through the constructed airbag;

Figure 15 illustrates schematically the inflation of the airbag of Figure 14;

Figure 16 illustrates the arrangement of Figure 1 but incorporating hydraulic actuating means in place of the airbag;

Figure 17 is a plan view of the apparatus of Figure 16;

Figures 18 through 20 illustrate the operation of the hydraulic mechanism;

Figures 21a-d illustrate a further embodiment of a first aspect of the invention;

Figures 22a & b and 23 illustrates a variant on an airbag according to an aspect of the invention; and

Figures 24a and 24b illustrate variants on a means for connecting two airbags to a common pivot.

The same parts in different Figures share common reference numerals, unless indicated otherwise.

Referring to Figures 1 and 2 of the drawings, a first pair of members 3 are pivotally connected, along pivot rod 7 (which may also hold the airbag to be described in detail later), to a second pair of members 10 of much shorter length than members 3 and terminating in free end 11 which has holes 11a or other fixing means to allow attachment of various accessories thereto. A top heavy duty or reinforced lifting plate 4 is disposed

between and attached to the upper regions of members 3 for engaging with a load, and a bottom reinforced lifting plate 2 is similarly disposed between and attached to the lower regions of members 10. The bottom edges of members 3 and 10 bear ground-engaging pairs of rollers 6 attached to the members by means of pivot pins 5. One of the roller pairs is fixed, the other slides horizontally. In Figures 1A and 2A, a platform, lifting device or order-picking device indicated schematically at 40 is fixed to the upper end of member 3.

Figure 2B illustrates an extension member 11b which is secured to end 11 of member 10 (see Figure 1) to form the embodiment shown in Figure 3.

In Figures 3 and 4, the second pair of members 1 are of the same length as members 3, this arrangement being suitable for the addition of a top table 8, as shown in Figure 5. Each of the upper ends of members 3 are pivotally connected to the underneath surface of top table 8 whilst the upper ends of members 1 travel horizontally on rollers 110 passing through respective channels 115 as the apparatus is operated. Also shown in Figure 5 is an inflatable airbag 9, which is a multi-compartment airbag according to the second aspect of the present invention, the airbag 9 being inflated to effect load handling. The airbag 9 is fixed to the pivot rod 7 by means of airbag holding strap 13.

In Figure 7, two units each comprising pairs of members 1,3 are linked together by pivot pins 5 to give greater height, the airbag 9 being disposed between the members of the lowermost unit.

In Figure 8, a unit comprising members 1,3 has connected on top of it, by means of pivot pins 5, a unit comprising members 3,10. The load 40 is supported between the uppermost pair of members 3, either on plate 4 or on the members themselves, and is secured against sliding off by removable stop means 18. At the base of the apparatus, rollers 6 travel within a base frame 12, the latter incorporating an anti-tilt locking device (not shown). The base frame 12 is itself mounted on wheels 42 and includes a towing bracket 15 so that the whole apparatus may readily be moved around as required.

In Figure 9, the same basic arrangement as shown in Figure 8 is illustrated, this time with an

extended flexible chute 21 extending from the upper surface of uppermost members 3. This variant is particularly suitable for discharging the contents of a container. A removable pivoting tilt stopper 20 is attached to members 3 as shown.

In Figure 10, the upper end of uppermost member has connected thereto a pivoting accessory attachment holder 17 which cooperates with support bar 22 to engage an accessory 23. The accessory 23 may be, for example, the functional equivalent of the blades of a fork lift truck, or loading platform, or stand-on platform such as is provided in conventional order-picking devices. The airbag is deflated to allow the bracket 23 to be engaged beneath the load to be lifted, and then inflated to lift the load. The interconnection of members 1,3 and 10 are such that the forces are transmitted along the apparatus in such a manner as to counterbalance the load, thus avoiding overturning. Another major advantage of the apparatus shown in Figure 10 is that the apparatus, having no permanently extended support arms, can be more readily manipulated in for example solid wall loading bays.

Figures 11 through 14 illustrate the method of construction of the airbag, which comprises alternate large and small sheets 1, 2 respectively joined by radio-frequency welding along lines 6,6a, B and C Corner reinforcements 5 serve to stabilise and strengthen the corners of the finished bag..

The sheets 1 and 2 have a central hole 8 therein surrounded by radio-frequency weld line 7, this hole serving to allow the air pumped into the bag from inlet 12 to rapidly fill the whole bag during inflation.

Large and small retaining straps 4, 4a are welded to the large sheets 1 as shown in Figure 13, along radio-frequency weld lines 3, and the airbag is bounded by small bottom sheet 9 and large top sheet 10, both without holes.

As can be seen in Figure 15, inflation of the bag by pumping air in through inlet 12 causes the bag to inflate as shown, with one side being restrained against inflation by means of retaining straps 4, 4a which are secured to bar 7. To deflate the bag, the air is simply let out of outlet 13 and the weight of the members or load returns the airbag to the deflated

condition.

In Figures 16 through 20, an alternative actuating means is illustrated, which comprises a hydraulic/pneumatic actuator 30. This comprises hydraulic/pneumatic cylinder 31 with a rear clevis 32 which mounts the cylinder onto the pivot rod 7. A rod 33 is extended and retracted relative to the cylinder 31, and top and bottom actuators 34, 34a respectively are pivotally mounted to the rod at hinge 35 with the free ends of actuators 34, 34a being preferably pivotally connected to members 3, 10 respectively of the handling apparatus. In the closed position as shown in Figure 18, the rod 33 is fully extended out of cylinder 31 and actuators 34, 34a lie flat against rod 33. However, upon retraction of rod 33 within cylinder 31 the actuators 34, 34a are forced, by virtue of their pivotal connection to members 3, 10 to pivot as shown in Figure 19 which represents the open position, thereby forcing members 3, 10 apart. Such an arrangement would require a hydraulic reservoir and motor, both of which would be located outside of the apparatus and are not illustrated in the drawings.

Figures 21a to d show a further embodiment of the load handling apparatus 40 which is capable of lifting a load and tilting a load two directions. In this embodiment, the apparatus includes a top table 42 for bearing a load, with removable, drop in, load safety bars 44,46 inserted in recesses (not shown). In this embodiment, each of the first pair of outer members 50 comprises a rigid member having a pivotally mounted roller 6 at a first and pivotally attached to the table at a second end 52. Each of the second pair of inner members 54, comprises an upper arm 56 and a lower arm 58 section of the same length and pivotally mounted on pivot rod 7. The first pair of outer members 50 are also pivotally mounted on pivot rod 7. The free end of the lower arm section 58 includes a rotatably mounted ground engaging roller or wheel 6. The free end of the upper arm section 56 includes a rotatably mounted roller or wheel 60 which runs upon and travels along an underside of the top table 42. A recessed channel (not shown) similar to that shown in Figures 5a and 5b is also provided, and through which respective rollers 60 run. The channels help to prevent the table from tipping over at larger angles. A first airbag 64 is provided between the first pair of members 50 and the upper arms 56 of the second pair of members, and is attached to the pivot rod. A second airbag 66 is provided between the first

pair of members 50 and the lower arms 58 of the second pair of members and is attached to the pivot rod.

With neither airbag inflated, as illustrated in Figure 21a, the table is in its lowest position. Inflation of either airbag alone, as illustrated in Figures 21b and 21c, causes the table to tilt to either side. Inflation of both airbags by the same amount causes the table to lift vertically. Inflation of the airbags by different amounts, as illustrated in Figure 21d, causes a composite lifting and tilting motion of the table. As will be appreciated, such a table could be used to lift a load vertically, before tipping to discharge the load onto a raised surface.

The apparatus includes push button controlled pneumatic circuitry to power the lifting apparatus (not shown).

Figures 22a & b and 23 shows a variant embodiment of the airbag aspect of the invention. The variant airbag 70 is similar to that shown in Figures 11 to 15 except for the construction of the means for fastening the air bag to the pivot rod 7. Retaining strap members 72 and 74 are attached by electronic welding at the interface 75 between a central large sheet 76 and small sheet 78. The end portion of strap 74 is attached by welding to strap 72 and in use loops around the pivot rod to connect the air bag to the lifting apparatus. As shown in Figure 23, providing the air bag fastening means at the centre of the air bag helps to retain the symmetry of the airbag in use and prevents its deformation in use, thereby improving its performance.

In order to connect two air bags to the common pivot rod 7, as required by the embodiment shown in Figure 21, the connecting straps require modifying from those shown in Figure 11, as illustrated in Figures 24a and 24b. One suitable modification would be to provide the first airbag with connecting straps 81 configured to attach only towards the ends of the pivot rod 7 while the second airbag's connecting straps 82 are configured to connect toward the middle of the pivot rod and between the straps of the first airbag. A further suitable modification would be to provided castellated respective connecting straps 83, 84 that intermesh to provide a robust connection for each airbag along the length of the pivot

rod.

It will be appreciated that the features of the various embodiments shown in the Figures can be added to one another, used with one another, or incorporated by making suitable modifications as would be clear to a man of ordinary skill in the present art.

CLAIMS:

1. A load handling apparatus comprising at least one first elongate member having means for engaging a load and at least one second elongate member pivotally connected to said first-mentioned elongate member, and actuating means cooperating with said first and second elongate members to change the angular orientation of said first and second elongate members relative to each other.

2. An apparatus as claimed in claim 1, and including additional elongate members disposed so as to transmit the relative movement of said first and second members to the load, which is thereby manipulated as required.

3. An apparatus as claimed in claim 1, in which the at least one first member is substantially twice the length of said at least one second member.

4. An apparatus as claimed in claim 1, in which the at least one first member and said at least one second member are of substantially equal length.

5. An apparatus as claimed in claim 1, in which said at least one first and second members, each comprise a pair of members, each member of each pair being disposed generally parallel to the other member of the same pair and the two pairs being connected together by means of a pivot rod.

6. An apparatus as claimed in claim 1, and including an actuating means comprising a hydraulic or pneumatic mechanism.

7. An apparatus as claimed in claim 6, in which the actuating means comprises an airbag.

8. An apparatus as claimed in claim 7, in which the airbag is disposed adjacent the point of pivotal connection between said first and second members and is constructed such that inflation of the bag will cause a greater degree of inflation in the distal regions of the

bag, furthest away from the pivotal connection and a much lesser degree of inflation in the proximal region closest to the pivotal connection.

9. An airbag having a number of interconnecting compartments, wherein inflation of the airbag is restrained at one edge or part thereof.

10. A load handling apparatus as claimed in claim 1 and including an airbag as claimed in claim 9.

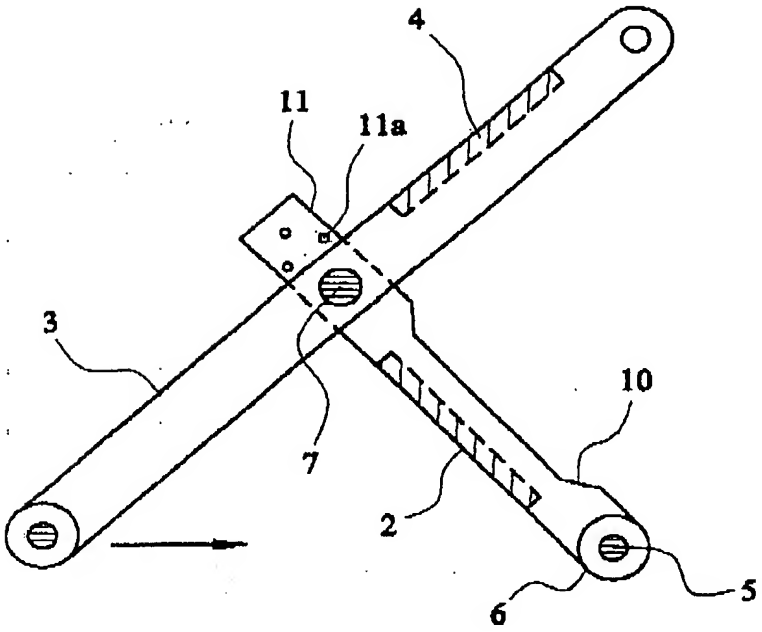


FIG. 1

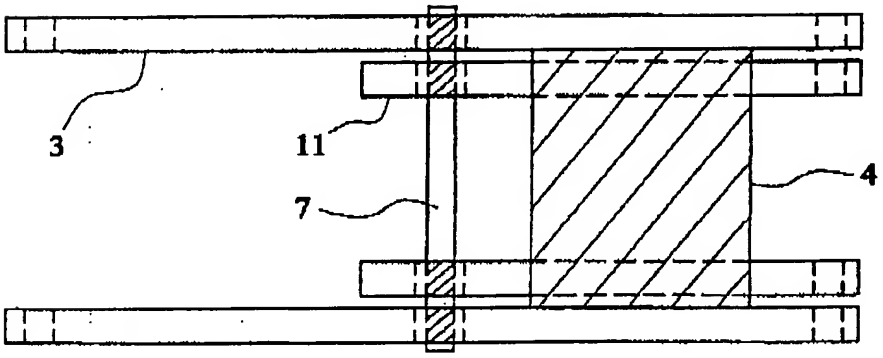


FIG. 2

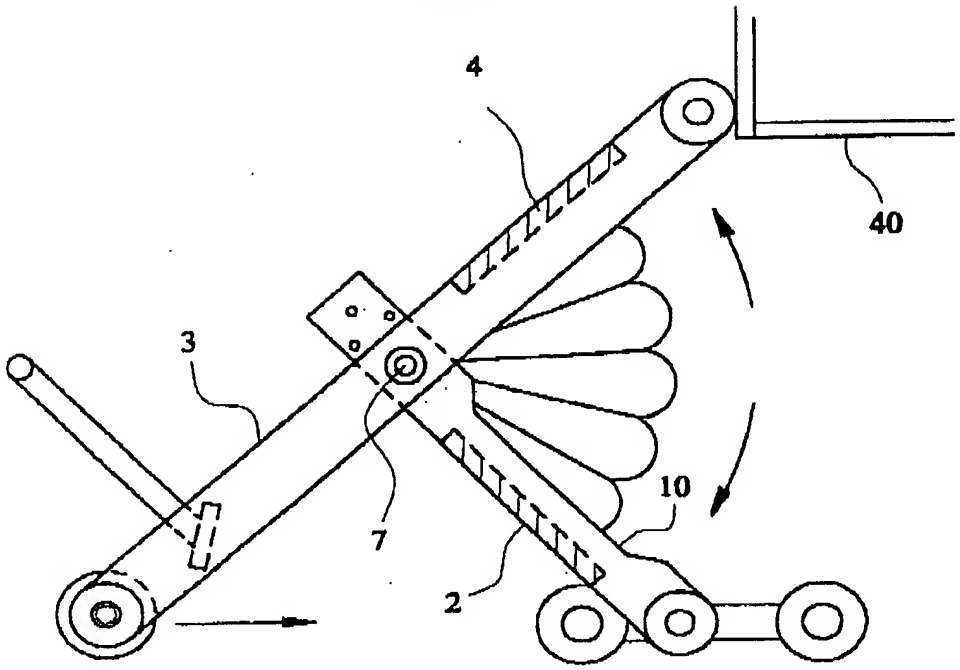


FIG. 1A

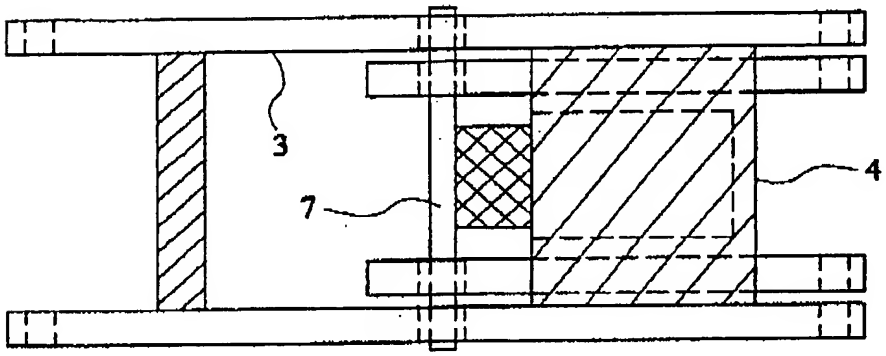


FIG. 2A

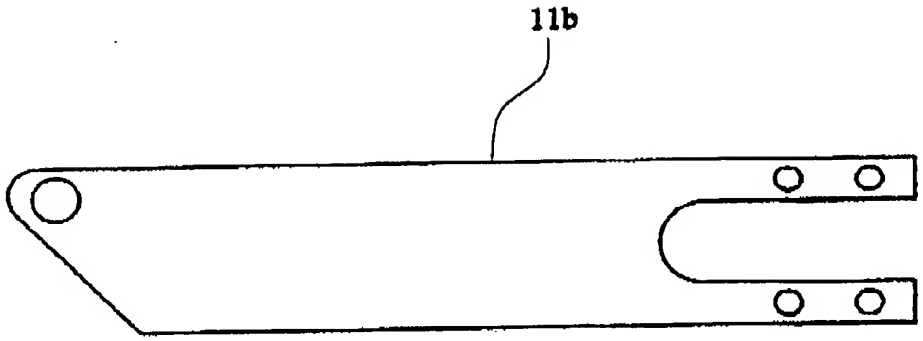


FIG. 2B

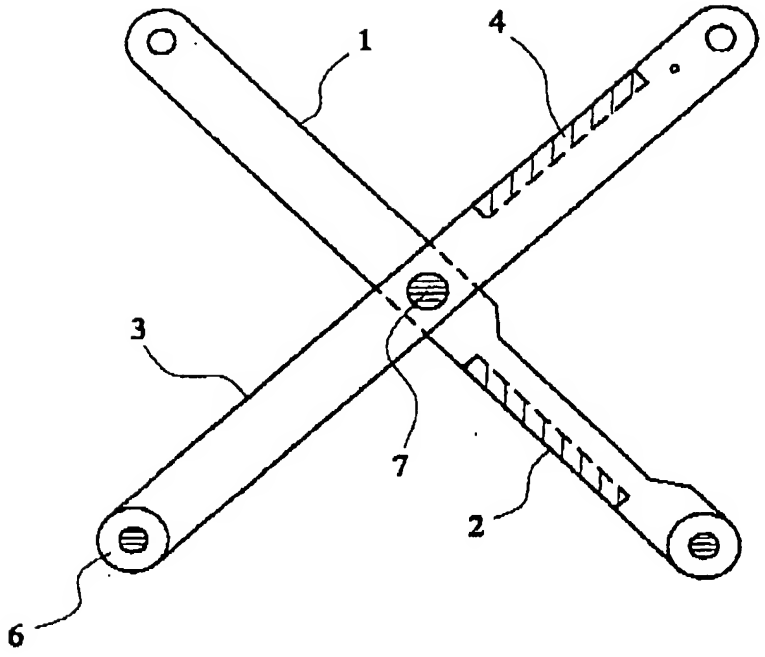


FIG. 3

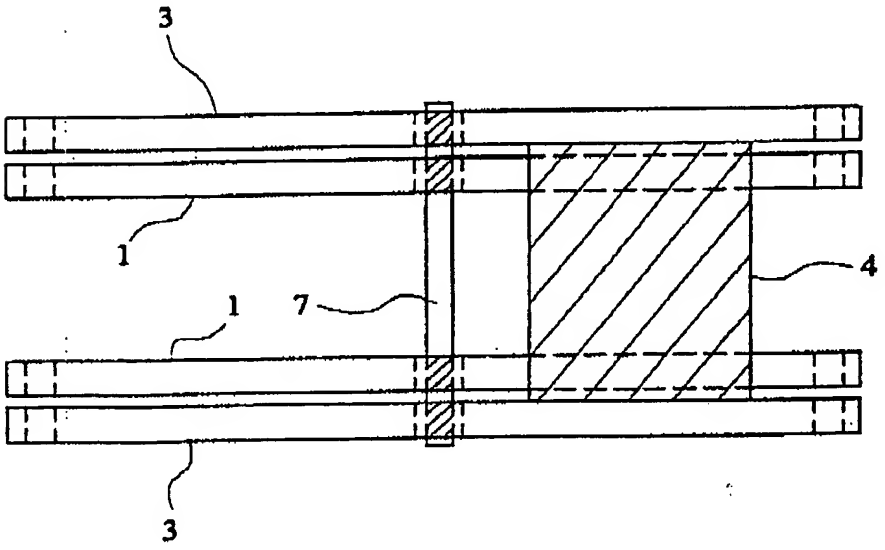


FIG. 4

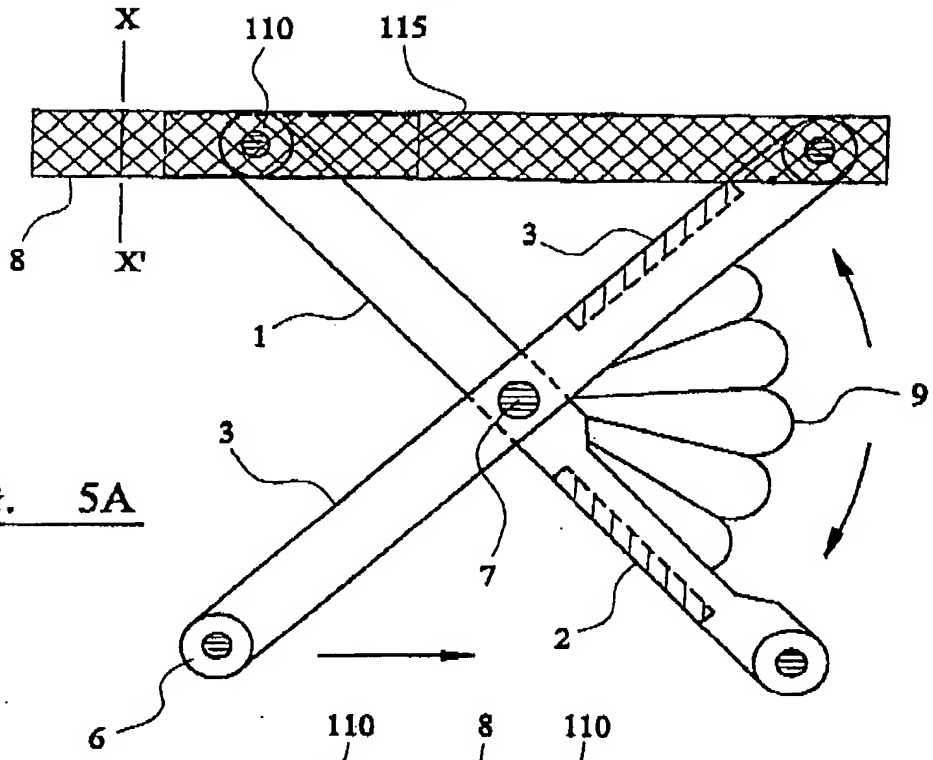


FIG. 5A

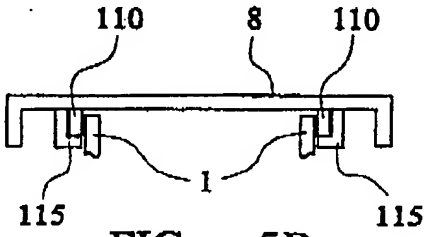


FIG. 5B

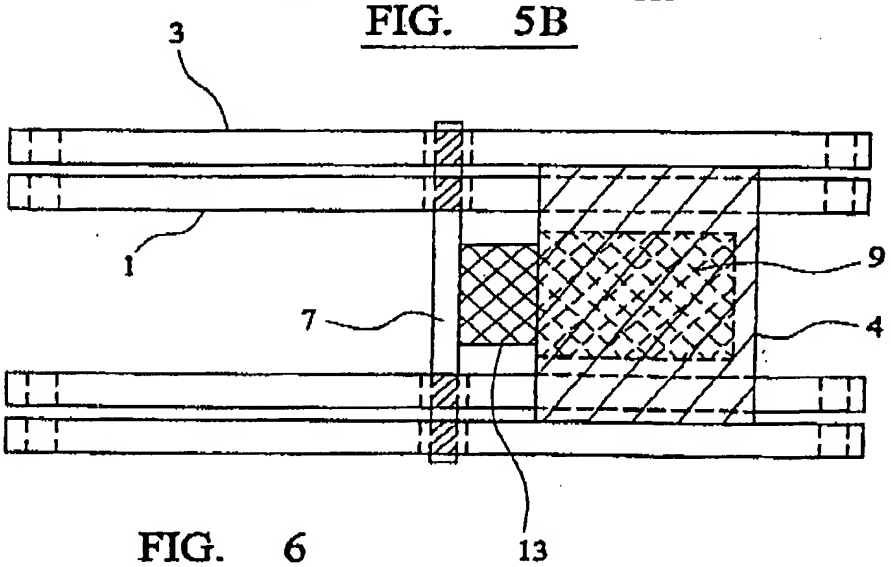


FIG. 6

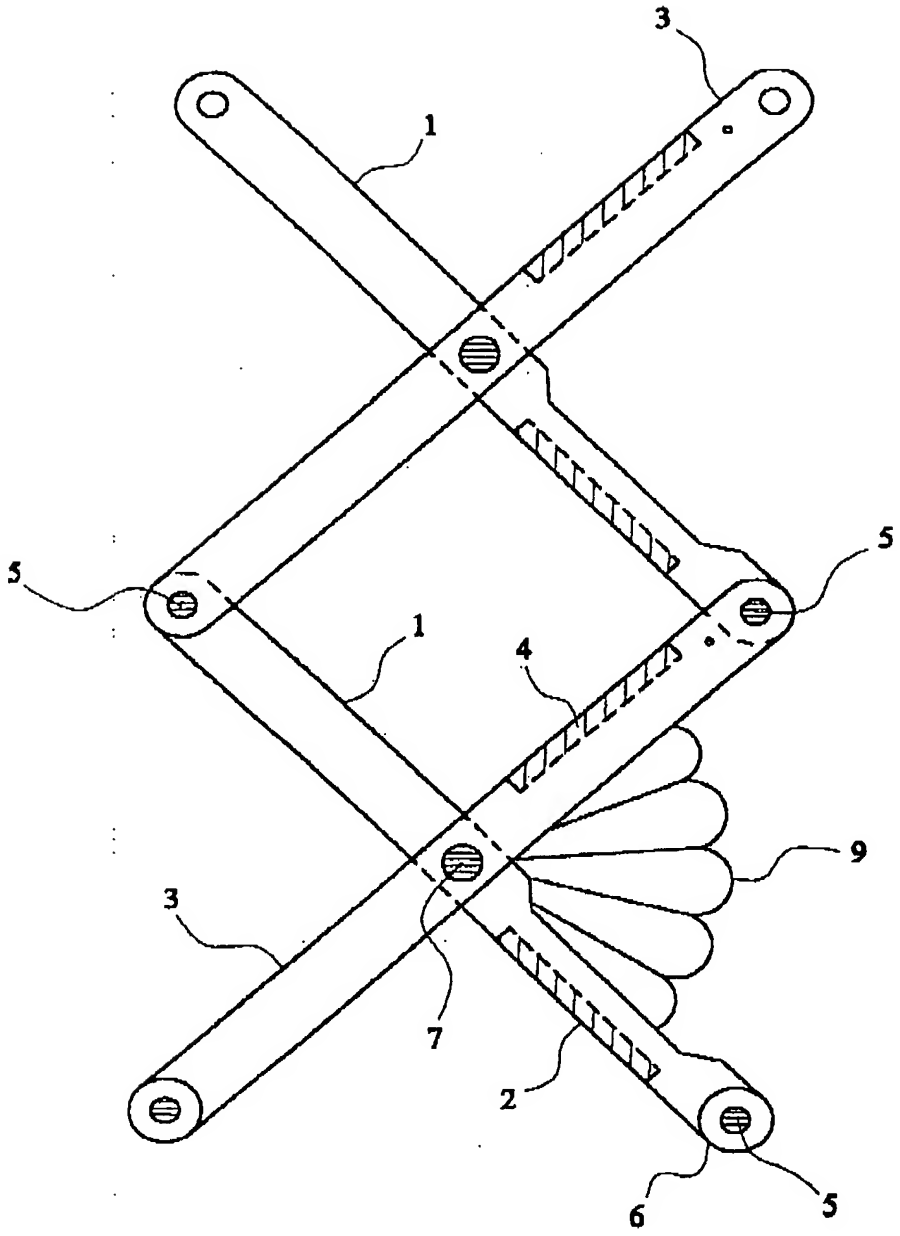


FIG. 7

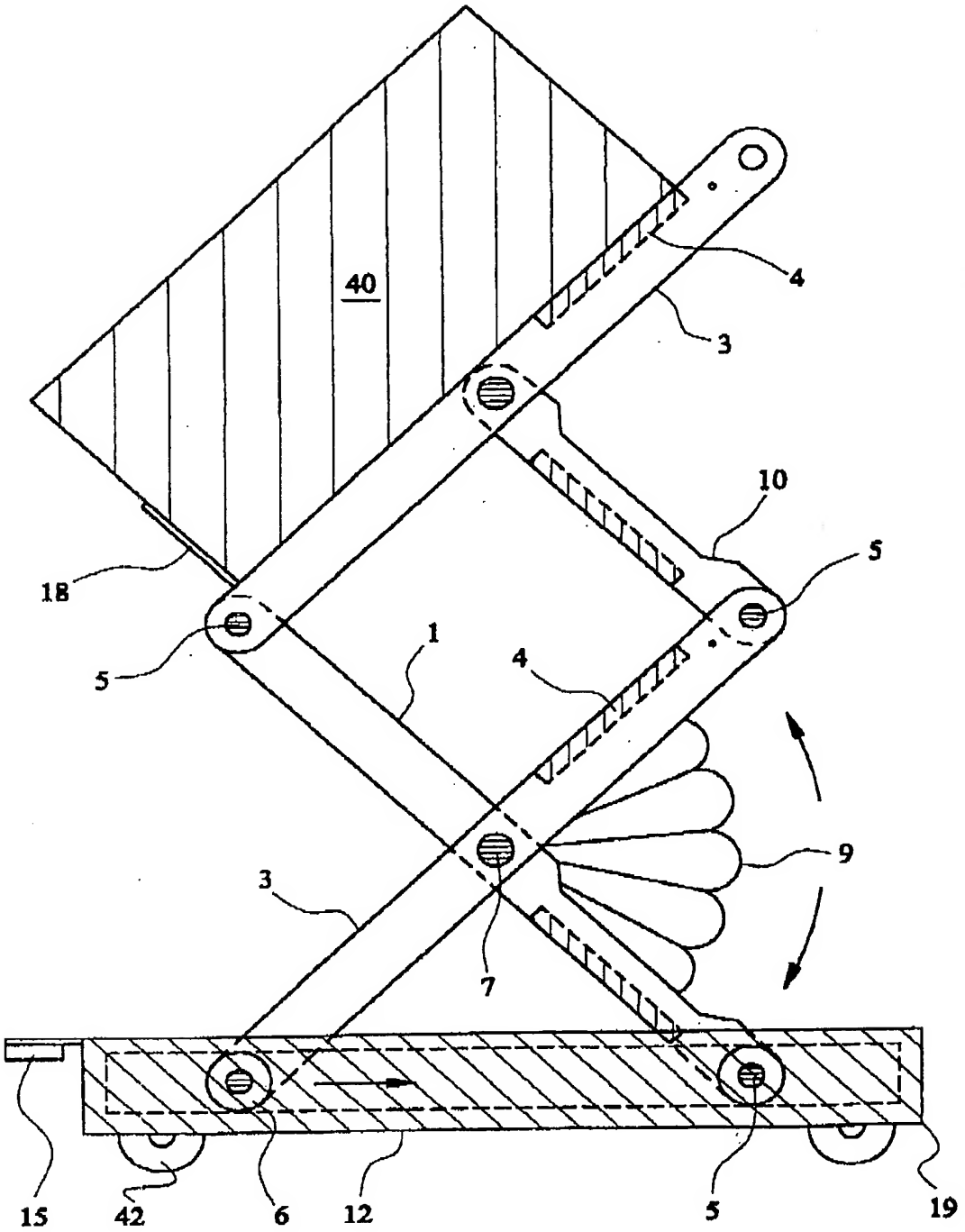


FIG. 8

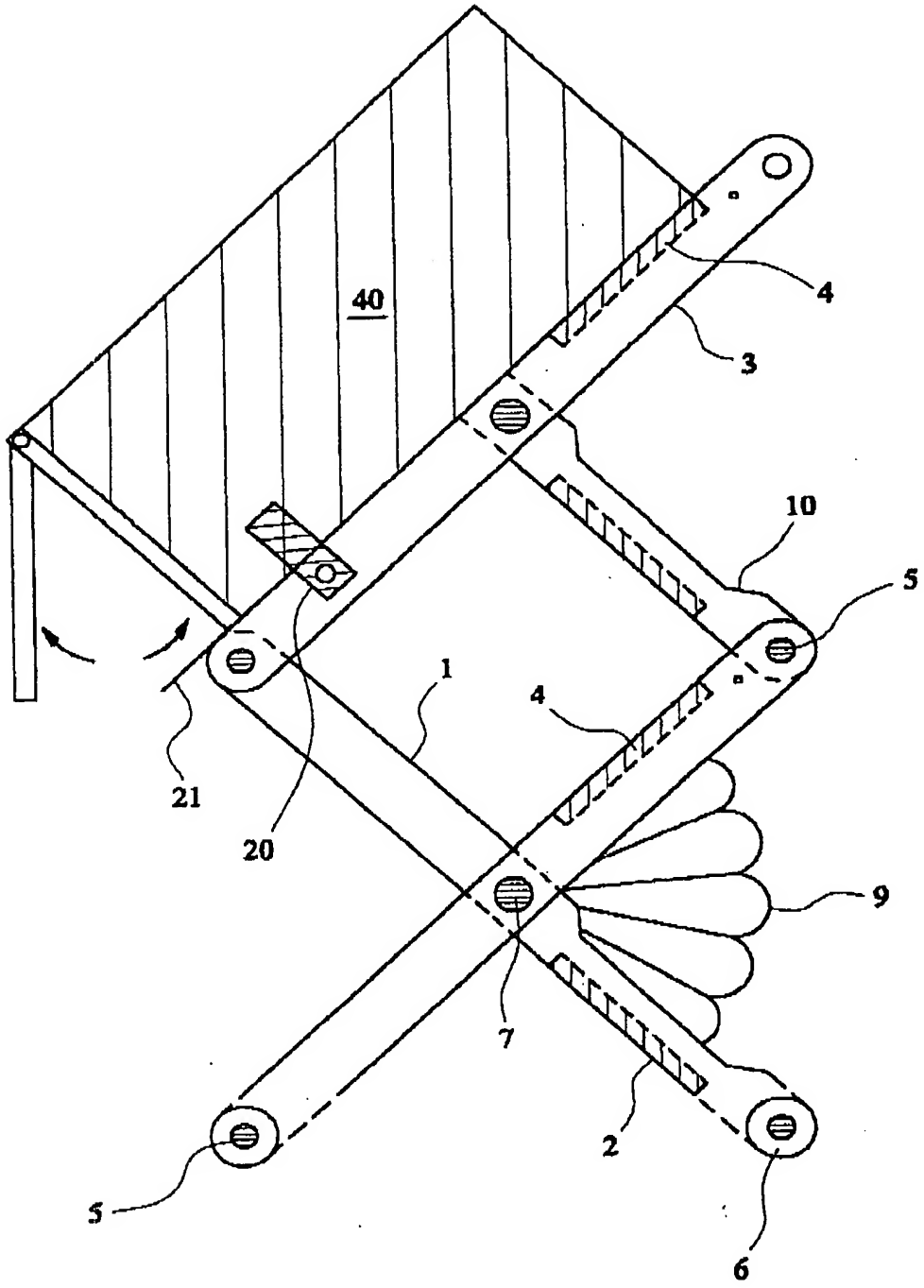


FIG. 9

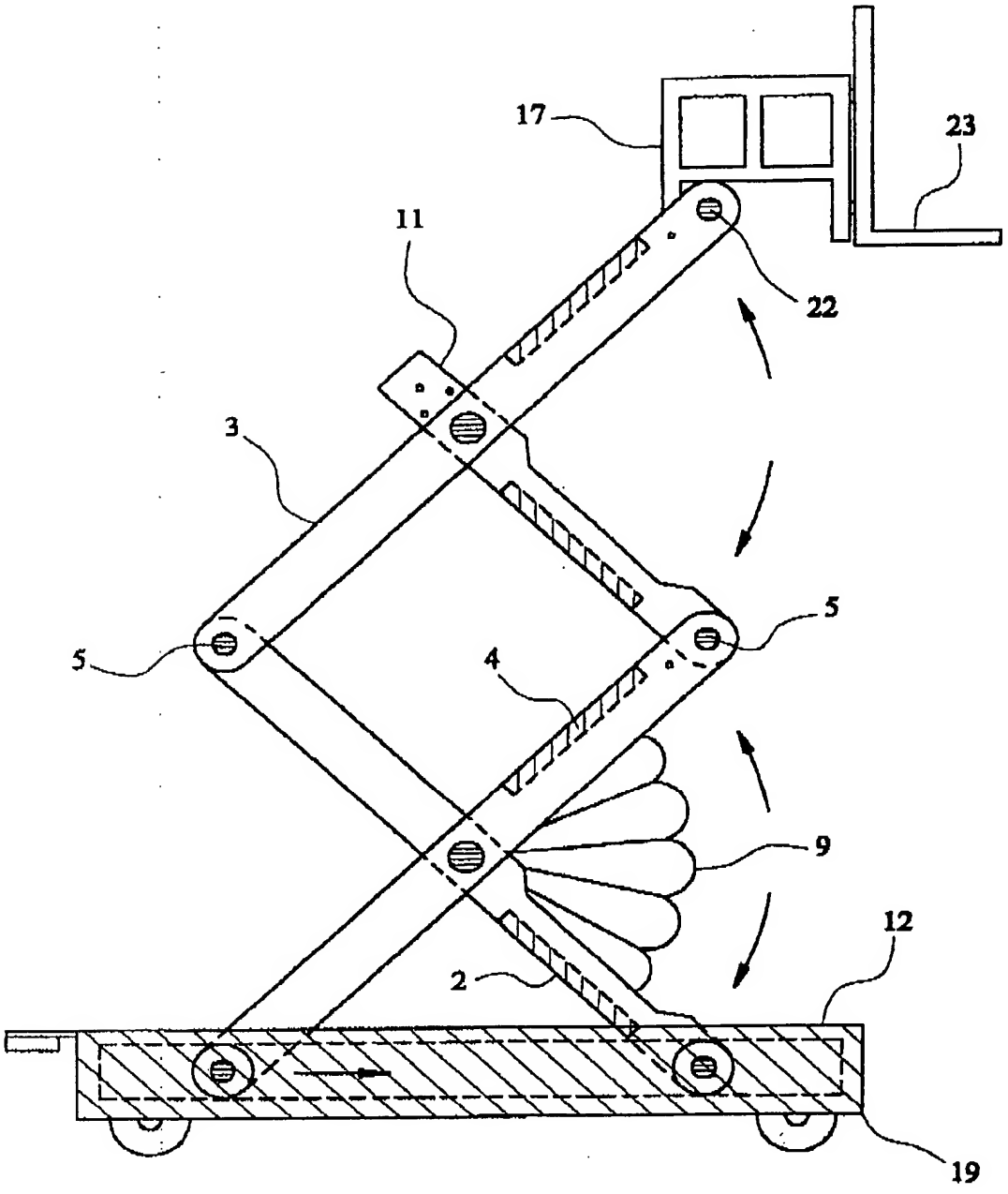


FIG. 10

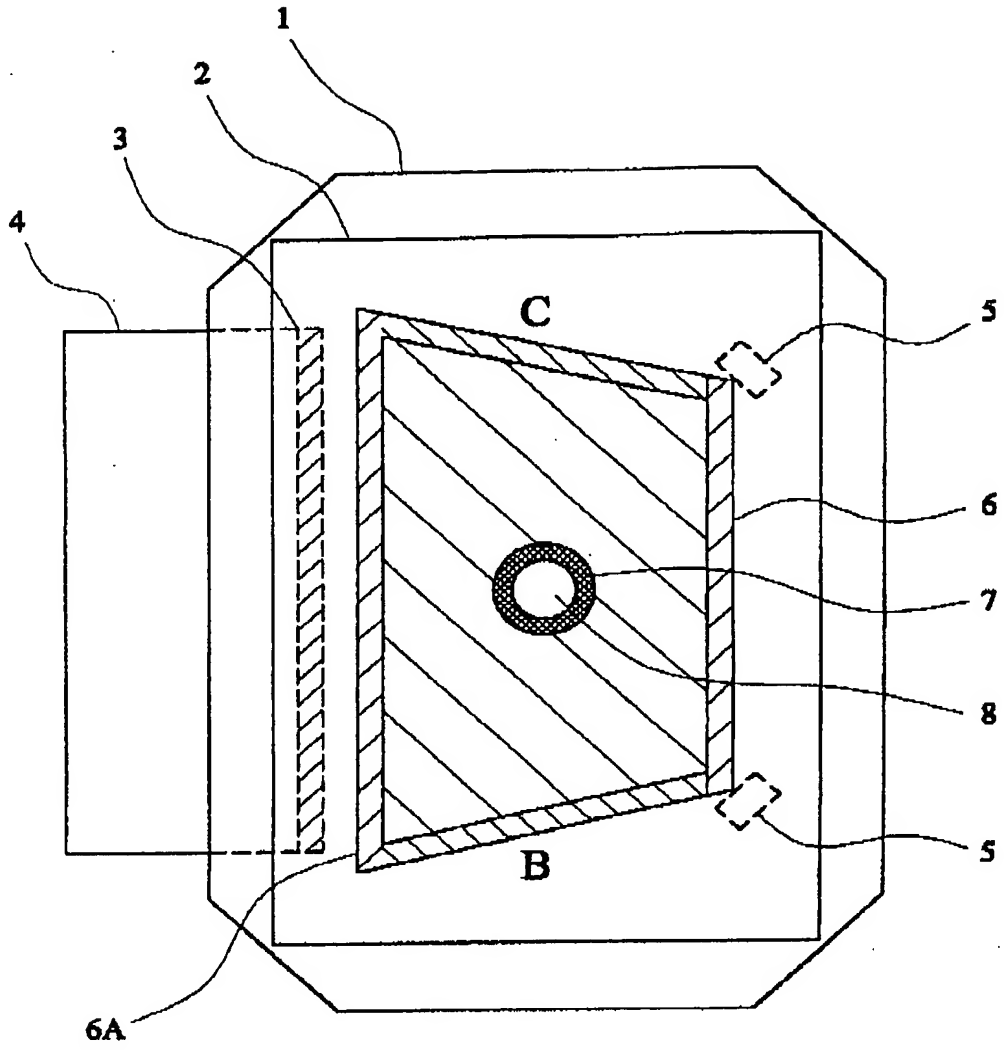


FIG. 11

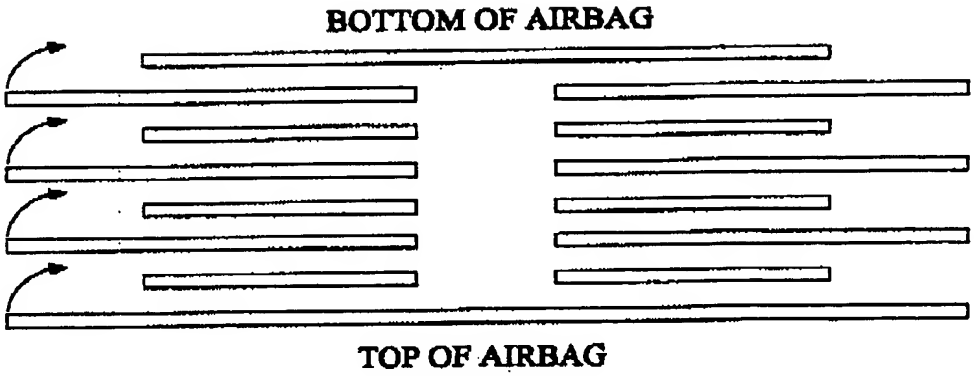


FIG. 12

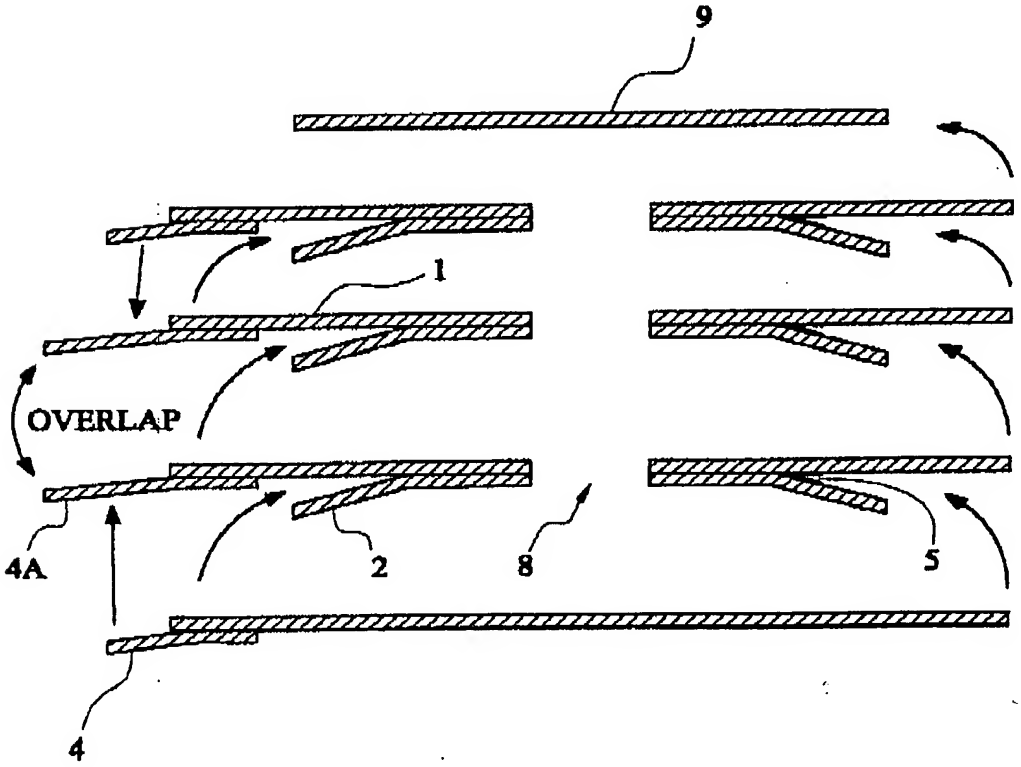


FIG. 13

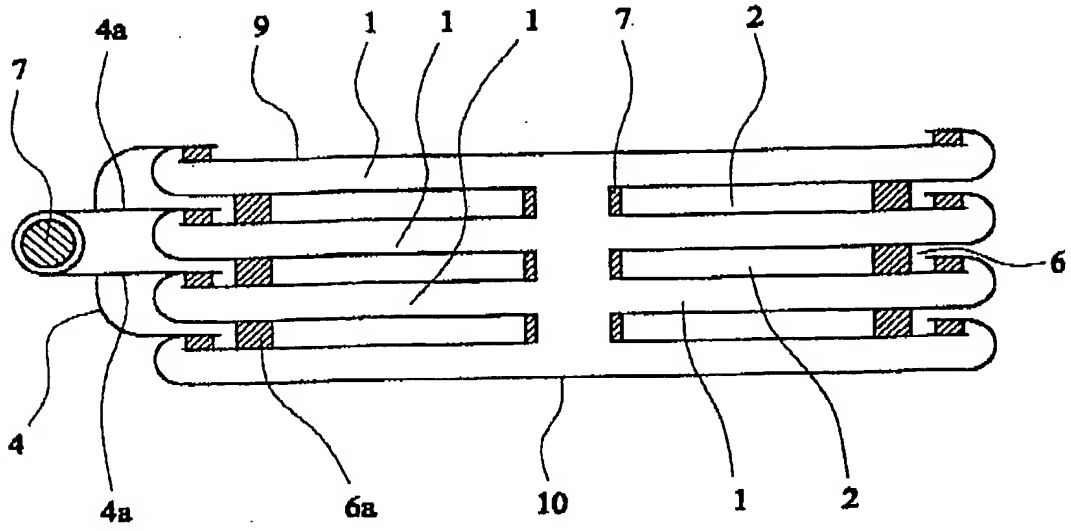


FIG. 14

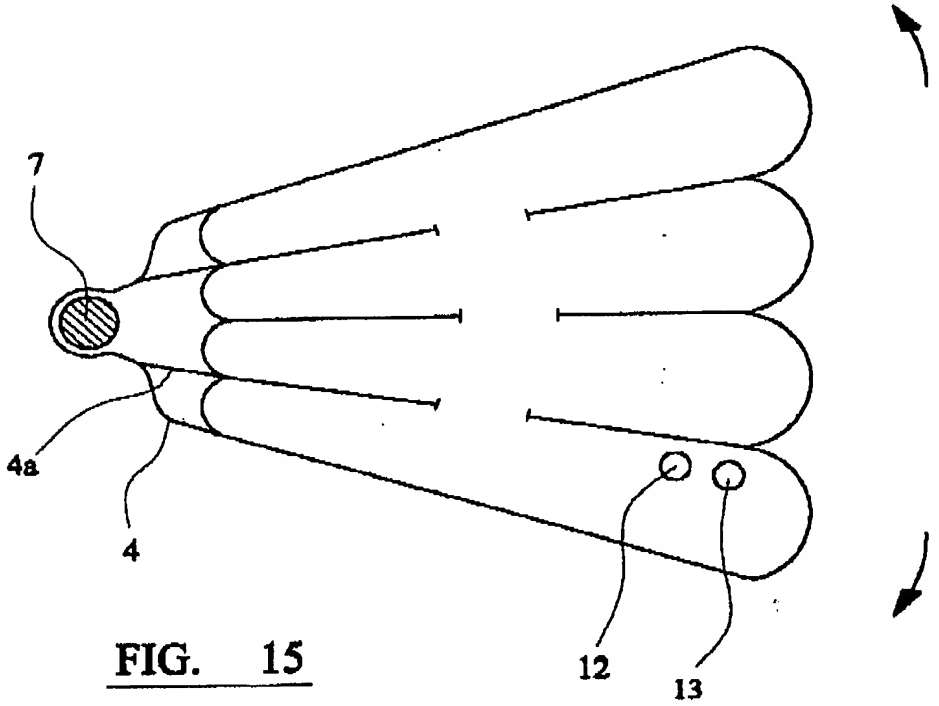


FIG. 15

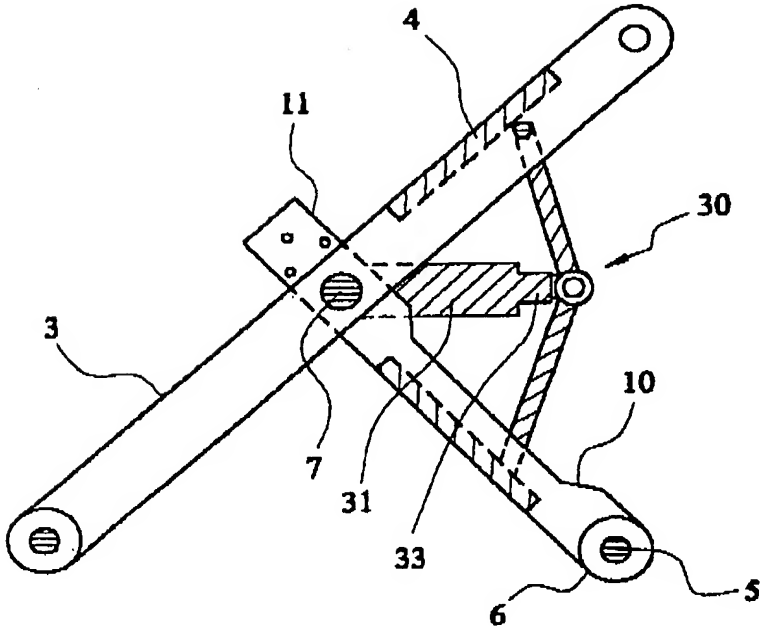


FIG. 16

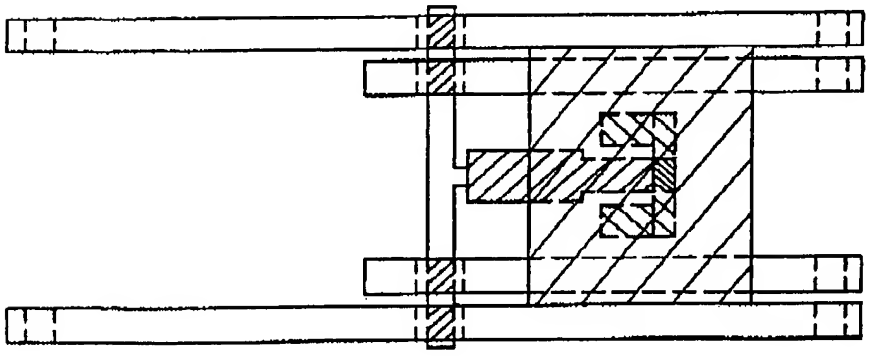


FIG. 17

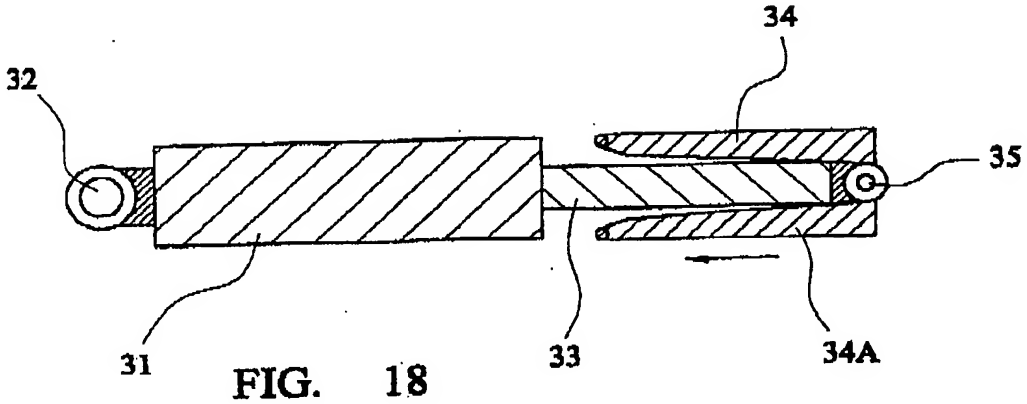


FIG. 18

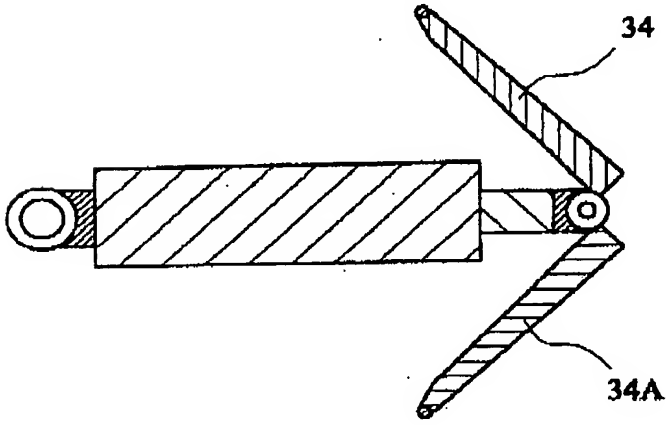


FIG. 19

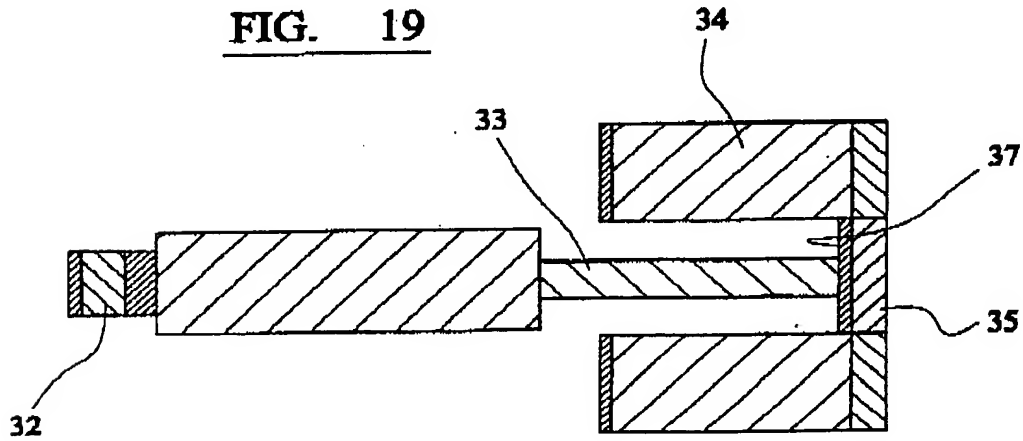


FIG. 20

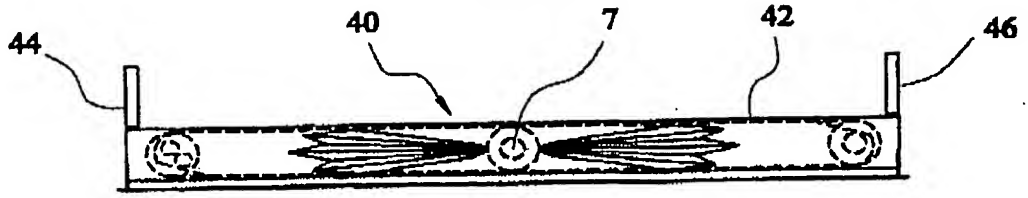


FIG. 21a

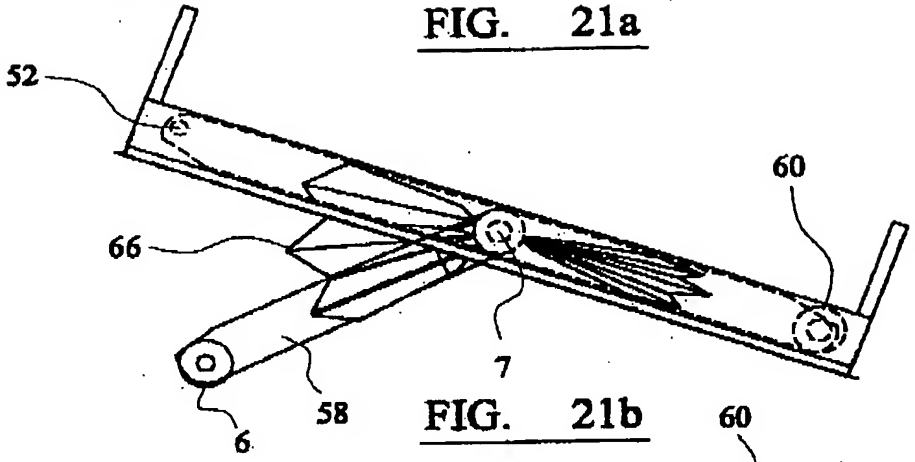


FIG. 21b

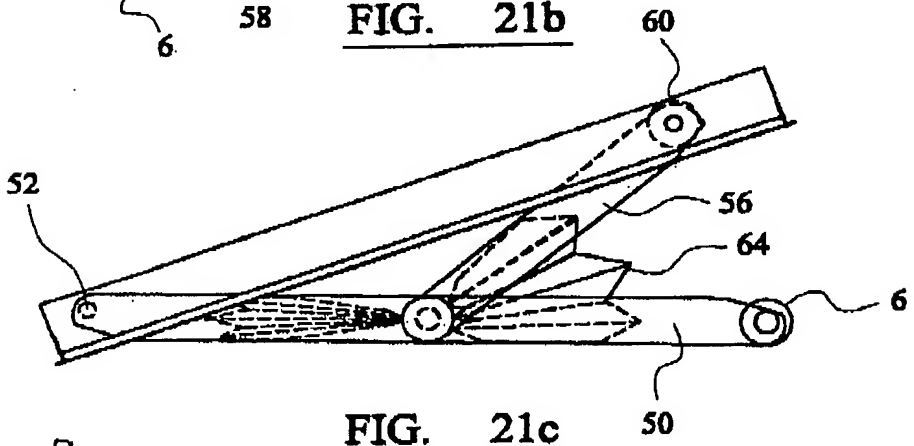


FIG. 21c

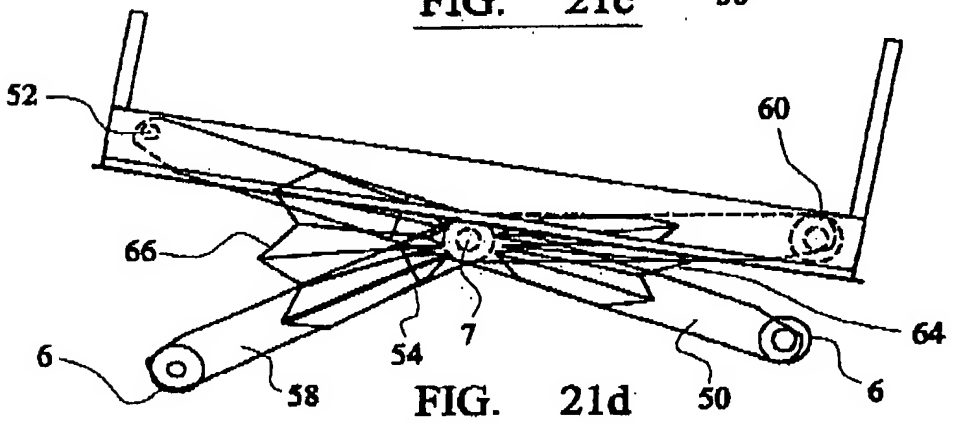


FIG. 21d

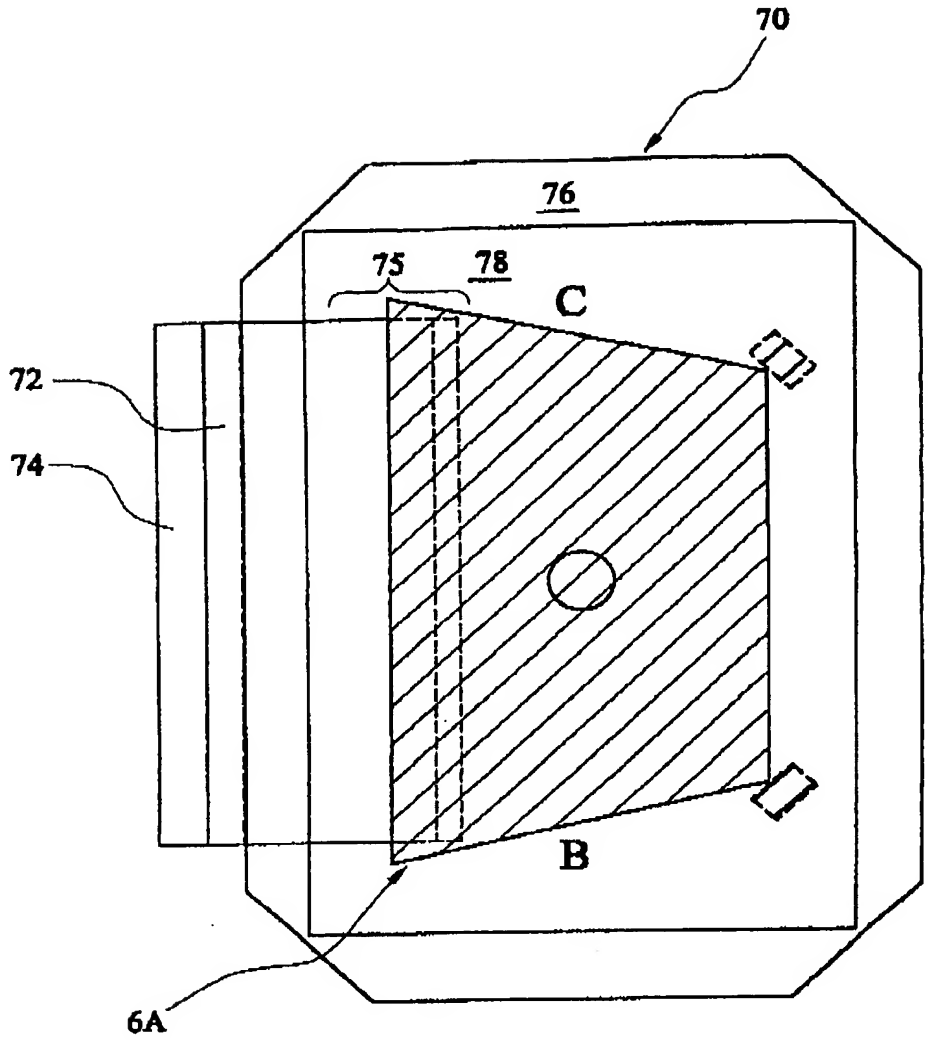


FIG. 22a

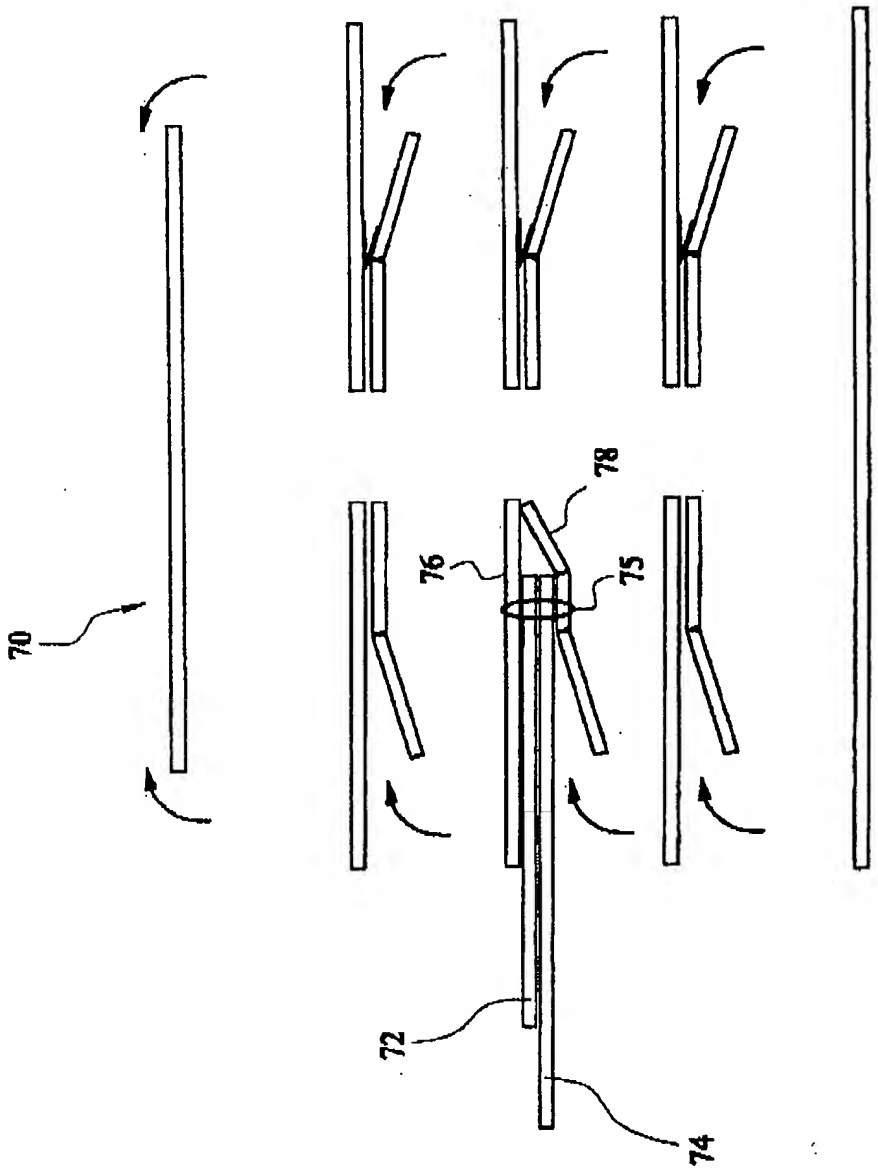


FIG. 22b

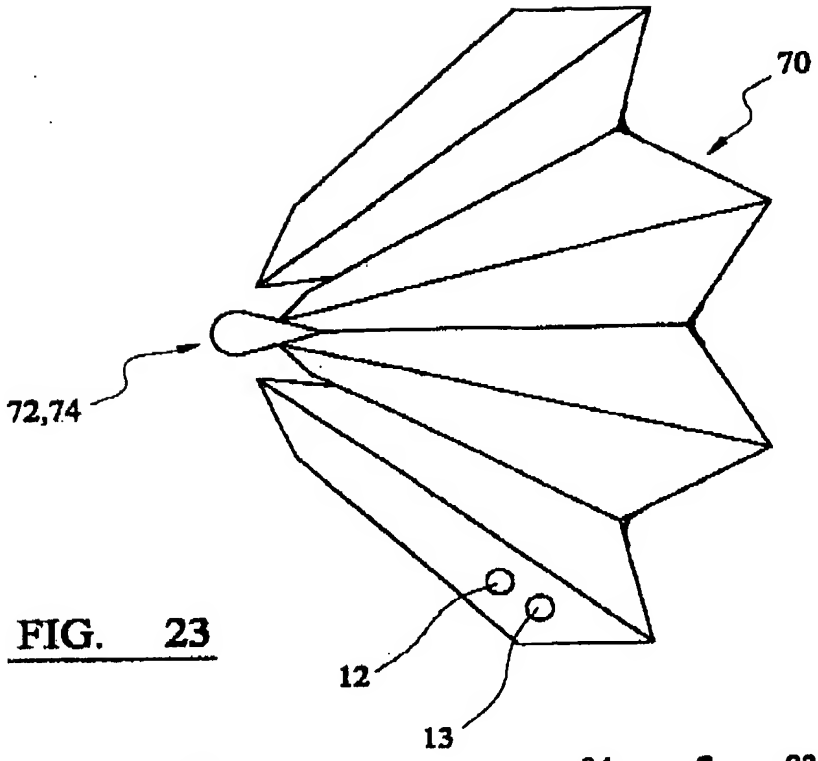


FIG. 23

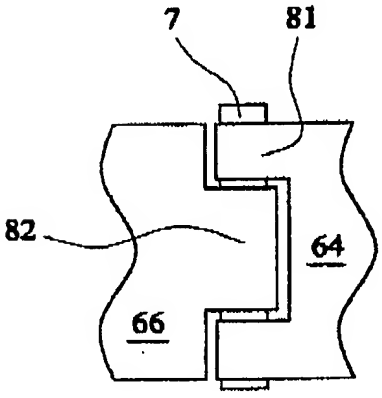


FIG. 24a

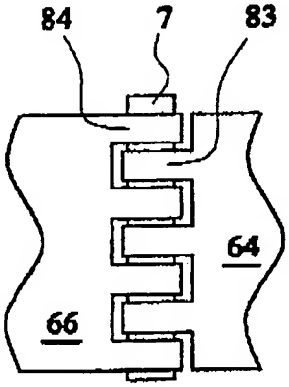


FIG. 24b

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02362

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B66F7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B66F F15B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 193 264 A (BOUSSO DINO E) 28 May 1970 (1970-05-28) page 2, line 34 - line 50 page 2, line 112 -page 3, line 6 figures 1-3	1,2,4, 6-10
X	US 5 446 938 A (WARNER ROBERT J ET AL) 5 September 1995 (1995-09-05) the whole document	1,3,6-10
X	GB 2 206 158 A (MCNIVEN THOMAS) 29 December 1988 (1988-12-29) abstract page 4, line 18 -page 6, line 24 figures 3-8	1,2,4-7

-/—

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 September 2000	02/10/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sheppard, B

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02362

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 542 806 A (KANG LEI) 6 August 1996 (1996-08-06) abstract figures 1-5	1,2,4-7
X	GB 1 501 047 A (PINGON PIERRE JOSEPH) 15 February 1978 (1978-02-15) page 2, line 74 -page 3, line 10 figure 1	1,2,4,6

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No PCT/GB 00/02362

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